California Department of Transportation
Design and Local Programs

Value Analysis Branch

VALUE ANALYSIS ANNUAL REPORT

FY 1997/1998

Caltrans

INTRODUCING THE CALTRANS 1997/1998 VALUE ANALYSIS ANNUAL REPORT
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When a Value Analysis team presents their recommendations to Caltrans managers at the conclusion of their study they expect a positive response. Part of their optimism is because the team focuses on issues that provide the greatest value to the owner - project costs or profitability and operational effectiveness.

This VA approach should be performed on every significant project early in the design process for maximum benefit. Reducing initial and long-term project costs, including user costs is an important goal of the VA team. But sometimes team members propose spending additional money, when needed, to meet required functions. The value methodology is just as effective in adding customer benefits as it is in saving money.

When asked to introduce the attached fiscal year 1997/1998 Caltrans Value Analysis Annual Report, I thought of the extensive use of VA in Los Angeles in my last year as District 7 Director before assuming my present assignment as Deputy Director of Caltrans:

- all my District Division Chiefs served on a VA Team to develop a Business Plan for the District.
- a team studied communication and timing problems of the Information Systems Service Center (ISSC) D-7 Help Desk with excellent results.
- VA studies on the Century Freeway Storm Drain damages assisted the District in their repair efforts and strategies for long-term fixes.
- we participated on a southern districts traffic operations study (TOPS) that will have long range strategy benefits.
- through use of a nearly full time District VA Coordinator (DVAC) and the Corporate Headquarters VA consultant contract for team leaders, we organized and completed five VE required studies of National Highway System (NHS) projects over $25 million in overall project costs and eligible for Federal funding.
- initial cost savings as verified by District project managers for four of the completed VA studies of NHS projects approaches $20 million.

The 1996 federal mandate to perform VA studies on NHS projects over $25 million is affecting $27 billion worth of projects that are part of Caltrans' immediate future. This places a much larger emphasis on the VA Program's role in our project delivery and financing of projects.

Not to be forgotten is the usefulness of the VA process on District-identified, voluntary project or process studies such as the first four examples above; also the independent, objective review of high profile projects such as the Toll Bridge Seismic Retrofit Program (including the San Francisco-Oakland Bay Bridge project) with 100% VA consultant team leaders and team members.

The purpose of the following report is to provide Caltrans management and Project Managers with an understanding of the past and future scope and use of Value Analysis in Caltrans. It will also be made available to our transportation partners in AASHTO, FHWA, and our local transportation authorities.

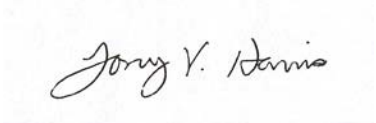


TABLE OF CONTENTS

VALUE ANALYSIS OVERVIEW

WHAT IS VALUE ANALYSIS?

Value Analysis/ Value Engineering is a function-oriented, systematic team approach, used to analyze and improve value in a product, facility design, system or service. It is a powerful methodology for solving problems and/or reducing costs while improving performance/quality requirements.

The VA Job Plan is an organized plan of action for accomplishing VA studies and assuring the implementation of the recommended changes. Below are summarized the 12 steps, as employed in Caltrans' VA Program, required to successfully complete a VA study. It begins with Identify Project and ends with Implement Alternatives.

Pre-Study Preparation	**Study Performance**	**Post-Study Implementation**
Identify Project	Inform Team	Report Results
Select Team	Analyze Functions	Assess Alternatives
Prepare Data	Create Ideas	Implement Alternatives
	Evaluate Ideas	
	Develop Alternatives	
	Present Alternatives	

Typically, VA studies take 5 to 6 days (not including pre-study and post-study activities) and require the cooperation of the project/ functional managers, resource advisors, and the VA Team members.

Caltrans does three types of VA studies:

- Highway construction projects. The use of VA to improve the value of projects has been demonstrated in all Caltrans Districts since 1969. Highway VA studies are broken down into two categories:
  1. NHS studies which are mandated by the NHS Act of 1995.
  2. District-Identified studies which are voluntarily identified by the Districts.

- Product studies. The VA process can be used to improve the quality of highway products. Typically, engineering products are items and systems as described in Caltrans' standard plans and specifications. Value Analysis can help identify products that need to be updated due to changing technology, outdated application, or any other changes that affect our standard engineering products.
- Process studies. The VA process can be used to improve the quality of Caltrans' processes, such as policy and procedures and business practices.

WHY USE VALUE ANALYSIS?

MAINTAIN FEDERAL FUNDING. Value analysis studies are now required on all projects greater than $25 million (construction, right of way, and capital outlay costs) on the National Highway Systems (NHS). The project is defined by the environmental document and may include multiple contracts over many phases. The NHS Act of 1995, the subsequent Federal Rule (February 1997- Subpart 627) and the Federal Aid Policy Guide, which added a new Chapter 6- "Value Engineering" define the application of this regulation.

BUILDING CONSENSUS WITH OUR TRANSPORTATION PARTNERS is becoming the way we do business in Caltrans. Federal and state legislation over the last several years has given the local authorities a greater role in deciding local transportation issues. Value Analysis is an effective tool to break down the conflicts and build consensus with project stakeholders and partners.

SOLVING DIFFICULT TRANSPORTATION PROBLEMS. The steps and tools of Value Analysis provide an excellent tool to focus on and solve our most difficult transportation problems. The more complex a project in terms of geometry, staging, environmental impacts, etc. the more opportunity it provides a skilled, well-led VA team to provide an in-depth analysis and subsequent innovative solutions for the project.

COST REDUCTION WHILE MAINTAINING OR IMPROVING PROJECT QUALITY is becoming a big part of the Project Development process, as the public is demanding more for less cost. Project costs should include the total cost of ownership, which includes both the original (construction) cost and subsequent operation and maintenance costs. VA recommendations should not include cost reduction at the expense of project functions.

ELIMINATION OF DETRIMENTAL DESIGN INFLUENCES. The following influences can negatively affect a project's design:

- Lack Of Information
- Wrong Beliefs
- Habitual Thinking
- Risk Of Personal Loss
- Reluctance To Ask For Advice
- Time Pressures
- Negative Attitudes
- Rapidly Changing Technology
- Strict Adherence To "Requirements"
- Poor Human Relations

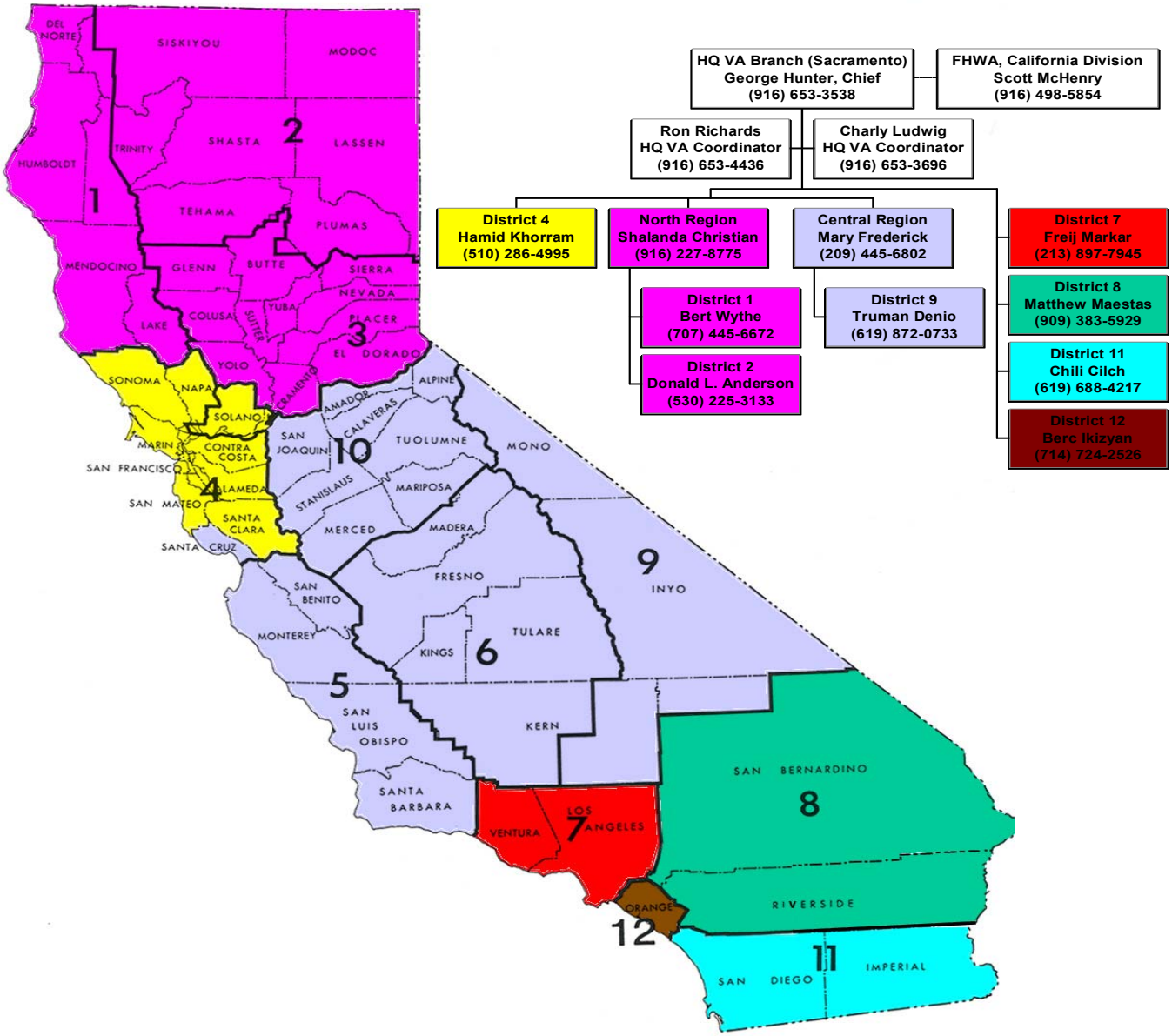
The VA review process can overcome the above influences by use of an objective, multi-disciplined team of individuals applying the VA methodology in a controlled environment.

VA PROGRAM ORGANIZATION

The California Department of Transportation (Caltrans) has been actively engaged in value analysis (VA) for 25 years and has an expanding program. Both consultants and in-house VA team leaders are used to organize and conduct VA studies, under the leadership of District VA coordinators. A full time staff of three engineers at the VA Branch in Sacramento manages a twelve-district VA program for the entire state.

VA Program Mission: Promote Caltrans' project and process improvement through proper and consistent application of the VA methodology.

VA Program Vision: Value Analysis to be recognized and accepted throughout Caltrans so that it is routinely applied to Projects & Processes and to be the leader in the application of Value Analysis in the transportation industry.



1997/1998 PROGRAM RESULTS

For the fiscal year ending June 30, 1998 Caltrans completed the following value analysis activities:

- Twenty-seven (27) studies were completed: nineteen- (19) highway project studies, seven (7) process studies and one (1) product study. An additional twelve (12) highway project studies were performed that will be reported next year.
- Caltrans' $155 million in implemented savings ranked it second in the nation, behind the Florida DOT's $168 million in a nationwide DOT total of $750 million.
- Twenty-five (25) Cost Reduction Incentive Proposals (CRIP), otherwise known as Value Engineering Change Proposals (VECP), were submitted by contractors resulting in $1,296,965 State's share savings (50%).
- The total estimated construction cost of the nineteen- (19) highway projects studied was $1,823,467,000. From a possible 206 proposed recommendations, 56 recommendations were approved resulting in $155,118,354 savings. Tables 1 and 2 summarize the results of the mandatory VA studies and the District identified (voluntary) highway project studies as shown below:

Table 1: Mandatory NHS VA Studies – FY '98

Study Leader	No. Studies	Original Project Costs (Million)	Value Analysis Alternatives				Team Study Cost (x 1000)	Return on Investment
			Proposed		Implemented			
			No.	Savings (Million)	No.	Savings ($ Million)		
In-House	8	$260.5	44	$201.7	15	$74.1	$108	686:1
Consultant	6	$302.3	90	$145.0	18	$27.5	$177	155:1
Total	14	$562.8	134	$346.7	33	$101.6	$285	356:1

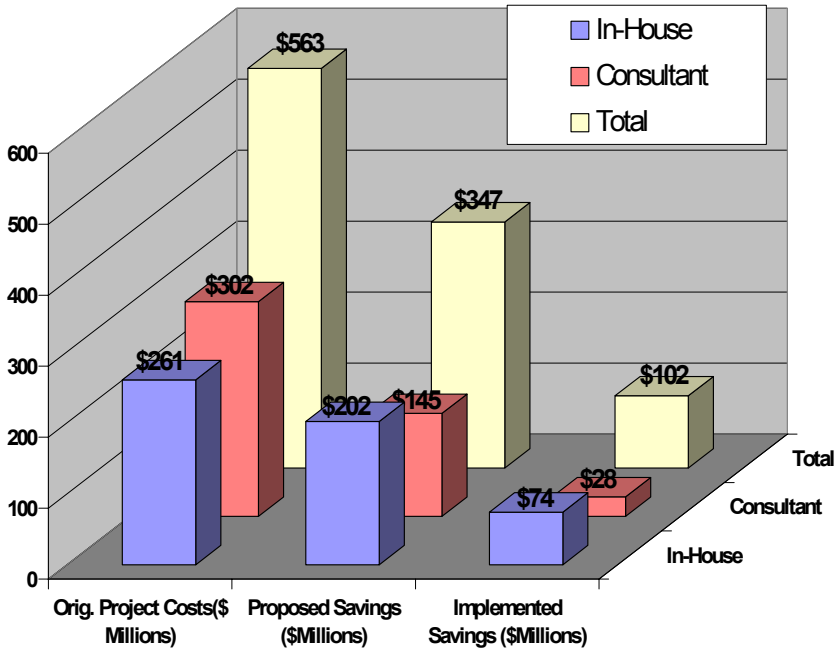
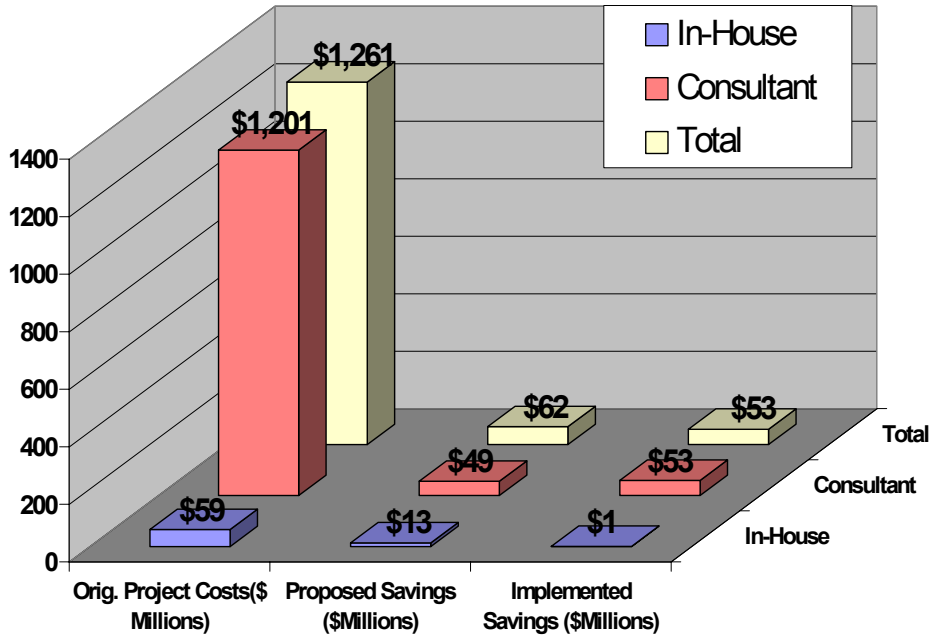


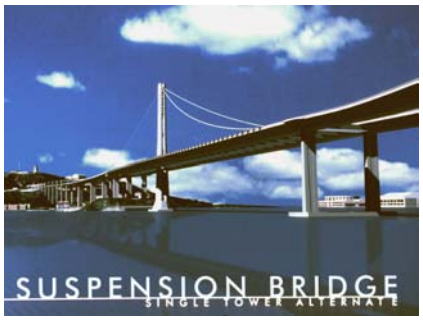
Table 2: Voluntary District VA Studies – FY '98

Study Leader	No. Studies	Original Project Costs (Million)	Value Analysis Alternatives				Team Study Cost (x 1000)	Return on Investment
			Proposed		Implemented			
			No.	Savings (Million)	No.	Savings ($ Million)		
In-House	2	$59.4	23	$12.8	10	$0.5	$39	13:1
Consultant	3	$1,201	49	$49.4	13	$52.9	$237	223:1
Total	5	$1,261	72	$62.2	23	$53.4	$276	194:1



1997/1998 HIGHLIGHTS

- Increased the Division of Structure (DOS) participation on VA Studies as follows:
  - Three District 7 seismic retrofit projects were studied with DOS Bridge Engineers participating as Team Members.
  - The Design Phase study on the replacement of the San Francisco-Oakland Bay Bridge East Span resulted in $52 Million cost savings on this $1.2 Billion project, complementing the 1996 VA Study which provided a recommendation to replace the structure instead of retrofitting.



- The third Century Freeway Storm Drain VA Study was completed early in FY 1998. These three successive VA Studies provided Caltrans with an independent, objective review by nationally recognized geotechnical and hydrological experts.
  - Study No. 1 (July 1996). Identified the global issues related to the I-105 drainage problems and provided recommendations for the interim project's grouting procedures and testing of voids.
  - Study No. 2 (Feb 1997). Refined the global recommendations identified in Study No. 1 such as controlling groundwater dewatering and disposal; Storm Drain replacements; Enhanced Pump Testing.
  - Study No. 3 (Aug. 1997). Study was conducted to provide the Project Manager with recommendations for the "Ultimate Fix" for long term solutions. Recommendations included Groundwater Control Measures, Ground Movement Control, Storm Water System Replacements, and Effects on Regional Groundwater Table Rise.

- Process Studies included:
  1. The success of the District 11 Business Plan, developed using the Value Analysis process with District top management, repeated itself in Districts 7 and 8. Tony Harris, District 7 Director sent a letter of appreciation commending the VA consultant Team Leader, Terry Hays for his leadership and facilitation. Additionally, the VA Program Business Plan was completed, defining the Program goals and strategies.
  2. A study of the Southern California Traffic Operations (TOPS) Strategic Plan, regional plan of traffic management technologies in the four Southern California Districts, identified $7.4 Billion in travel-time savings and $1.0 Billion in fuel and accident reduction savings for the 8.7 million daily trips. The study concluded that the completion of current, but incomplete, technology systems with continuity of operations at district boundaries by the year 2004 should precede the advanced systems such as Automated Vehicle Guidance Systems. These current technologies include: Traffic Management Centers, fiber optics, loop detectors, changeable message signs (CMS), ramp meters, auxiliary and truck climbing lanes, HOV lanes and managed lanes. Air quality emissions reductions and trip reliability, especially for regional goods movement, were identified in the study. The following Investment Levels were recommended:
     - IL-1: $1.2 Billion investment for $6.0 billion/year in user benefits (70% of total) with a benefit/cost ratio of 100:1. Implementation timeframe of 3-6 years.
       - Complete Traffic Management Systems (including SWARM)
       - Expand Traffic Information and Incident Response Systems
       - Improve Ramp and City Street Freeway Access
       - Add Auxiliary Lanes
     - IL-2: $2.4 Billion to increase to $6.8 Billion/year in user benefits with a benefit/cost ratio of 56:1. Implementation timeframe of 6-8 years.
       - Adds HOV Operations improvements.
       - HOV Drop Ramps
       - HOV Freeway to Freeway Connectors
       - Short HOV Gap Closures
     - IL-3: $ 5.7 Billion Investment for total TOPS user benefits of $8.5Billion/ year with a 30:1 benefit/cost ratio. Implementation timeframe of 8-10 years.
       - Major Operations Projects.
       - Freeway to Freeway Interchange Modifications, mostly in LA.

1998/1999 NEW INITIATIVES

- Sixty-four studies are planned for FY 1998/1999; 53 are highway project studies, 10 are process studies and one is a product study. The 53 highway studies include 43 studies for projects on the National Highway System, over $25 million in total project estimated cost and ten District-Identified (voluntary) highway project studies.
- Construction - Caltrans will continue to process contractor-submitted CRIPS (Cost Reduction Incentive Proposals). The District 11 Partnering/VA pilot program, utilizing the VA methodology in conjunction with the partnering sessions, will be monitored.
- A VA Report Guide, VA Team Study Guide, VA Procedures Guide and a VA Concepts Guide are being developed to provide standards and procedures for the application of value analysis to highway projects within Caltrans. Pre-study organizing meetings and post-study implementation meetings have now become part of the Caltrans VA Study process. The VA study process is being redesigned to capture non-financial benefits of studies in the areas of traffic operational, safety and schedule, and stakeholder consensus building. Mutually exclusive alternatives will be identified to eliminate over-reporting of potential savings.
- The Caltrans VA Database will be upgraded by a database consultant to capture all the procedural modifications and to better track study results. The database will operate on Windows NT environment consistent with the new computer equipment installed in November 1998.
- Caltrans' VA Branch will launch a VA Website in the latter part of the '99 fiscal year. The reporting portions of the VA Database, completed VA guides and manuals and completed VA studies will be available for viewing.

VALUE ANALYSIS TRAINING

Caltrans maintains an active VA training program so that the engineering staff has the opportunity to learn the value methodology before being assigned to VA teams. Between fiscal years, 1982 and 1998 Caltrans trained approximately 1300 individuals. Recent training activities include:

- Six NHI 40-Hour VA Training Workshops were held in Districts 2, 4, 6, 7, 8 and 11. NHI instructors Keith Borkenhagen, Ed Johnson and Dave Wolsheid assisted by Workshop Coordinator, Ron Richards trained 165 people on 25 projects.

- A 40 hour Module I workshop, led by Roger Sperling, TVI International, and George Hunter, VA Branch Chief, was held in HQ, Sacramento. Twenty-two Headquarters staff, including ten Structures Designers on four bridge projects, were trained using the current Caltrans Value Analysis Training Manual. This training session was held to increase Structures Design Staff participation on VA studies.

- Caltrans trained 187 people in 97/98. These included the State DOT Value Engineer Coordinators from Oklahoma and Missouri, three regional transportation authority employees, one City of San Diego employee, one Mexican city official, three Mexican transportation agency employees and two FHWA employees.

AWARDS

A new award, the "District Value Analysis Coordinator of the Year Award", was initiated in FY 1998 to recognize the value of the District Value Analysis Coordinators to the VA Program. Caltrans in cooperation with the FHWA, California Division have been recognizing excellence in the VA Program for six years through the Caltrans Award "E. Darwin Spartz Excellence in Value Analysis Award" and FHWA "Most Outstanding Value Engineering Study Award". The following list shows the most recent recipient of these awards:

Caltrans Award: "District Value Analysis Coordinator of the Year Award"

Purpose of Award: To recognize the important role that the District Value Analysis Coordinator contributes to the success of the Value Analysis Program within the Department of Transportation. The nominations are the District Value Analysis Coordinators from a given District or Region.
97/98 Winner: Jeanine (Chili) Cilch, District 11

Caltrans Award: "E. Darwin Spartz Excellence in Value Analysis Award"

Purpose of Award: To recognize the excellent application of VE/VA within the Department of Transportation made by Districts, as a whole, or certain individuals that have made significant contributions to the VA Program in a given fiscal year.
97/98 Winner: Diane Steinhauser/ Denis Mulligan, District 4

FHWA Award: "Most Outstanding Value Engineering Study Award"

Purpose of Award: To recognize outstanding implemented results from a particular VA/VE study done in a given fiscal year.
97/98 Winner: Benicia- Martinez Bridge Approaches, District 4

USE OF CONSULTANTS

Over the last few years Caltrans has executed and completed two on-call contracts to provide VA services and a project specific contract to value analyze the seismic retrofitting of seven of the nine statewide toll bridges, in 1996.

The latest on-call contract for VA services was executed in March 1998 and is valid until June 2000 for $2.5 million. In the past, Caltrans had reserved the use of the consultants for controversial, high profile projects that needed an independent, objective analysis. However, more recently the VA contracts are helping the department reduce the overload of studies required to comply with the huge NHS VA Study requirement.

HISTORICAL HIGHWAY PROJECT SAVINGS

The historical savings from the Caltrans VA program are presented graphically in the following two figures. Figures 1 and 2 show the implemented savings for highway projects. Figure 3 shows the number of completed studies by District.

Figure 1
VA Highway Project Savings – FY '96 to FY '98

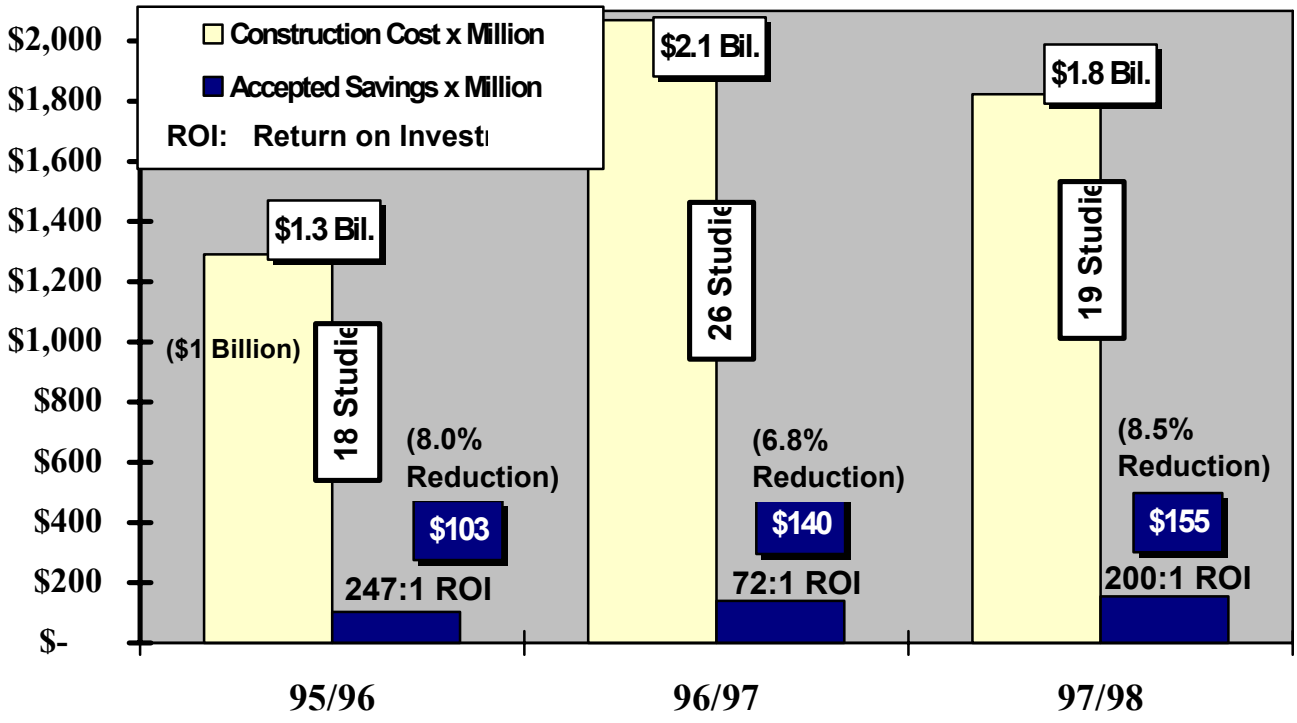


Figure 2
VA Highway Project Cumulative Savings

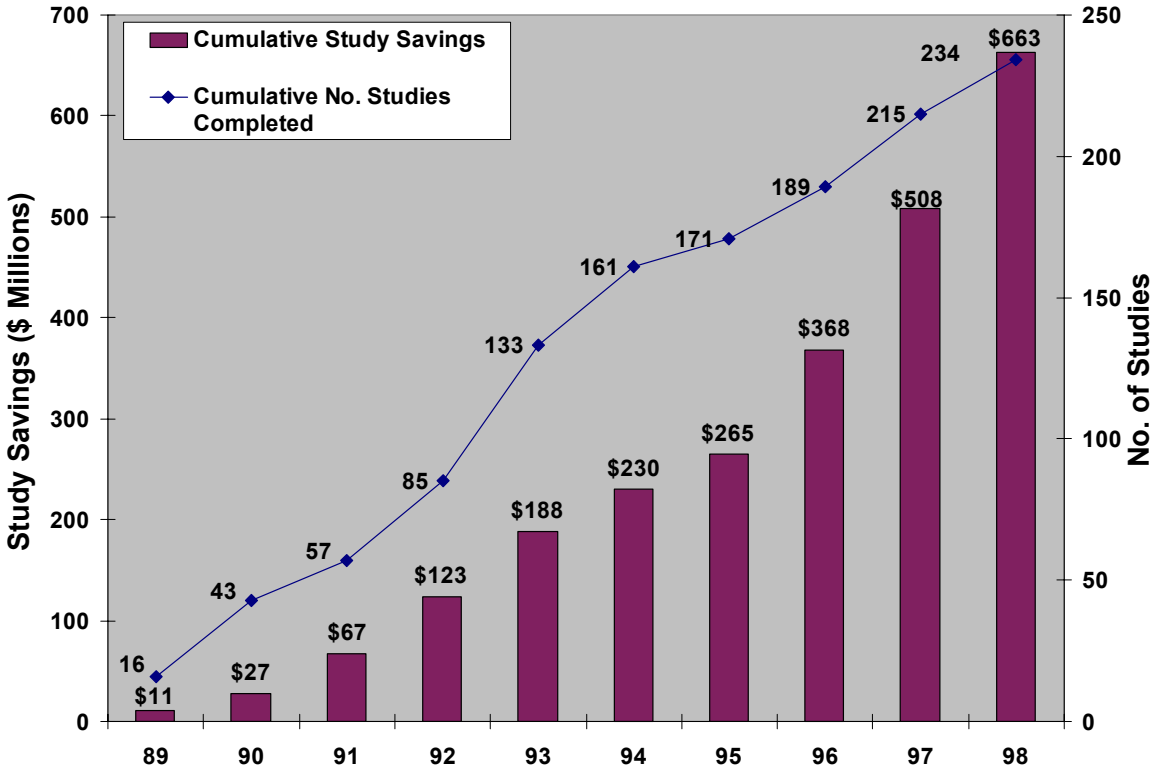
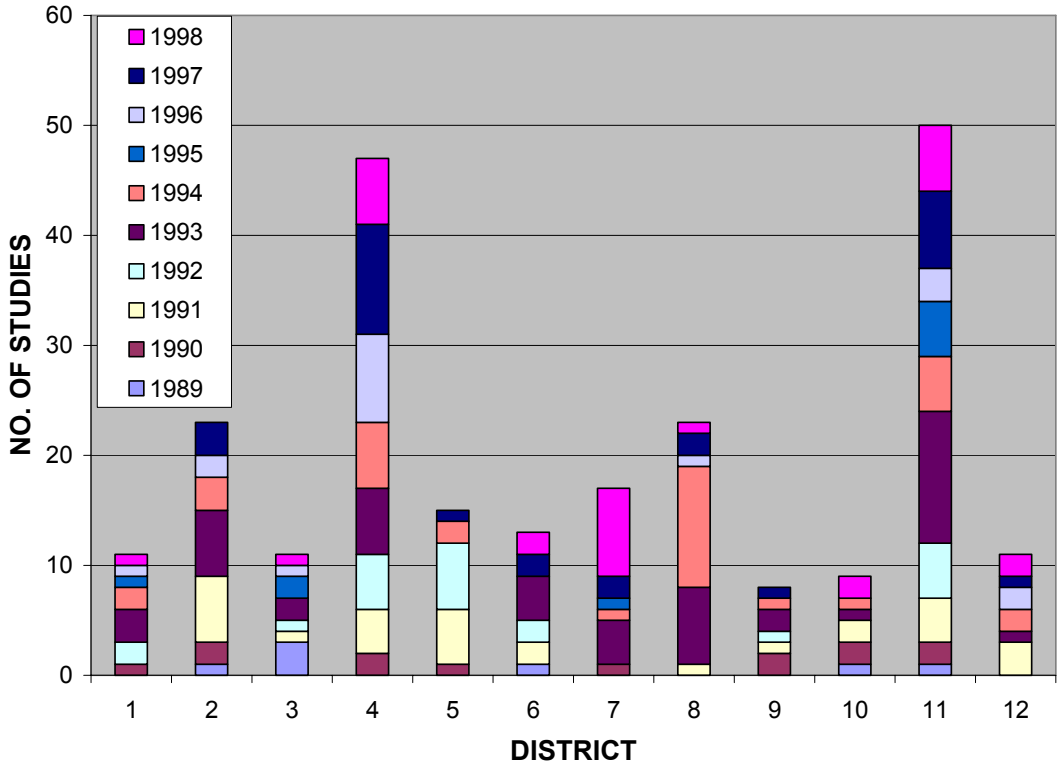


Figure 3
VA Study Completion Trend — FY '89 to FY '98



MANDATED NHS PROJECTS

Federal legislation mandates highway projects on the NHS with project costs over $25 million be value analyzed for federal aid participation. 410 projects, with projects costs of over $27 Billion have been identified under this mandate. 185 projects have been value analyzed to date; an additional 225 projects still need VA studies. The federal rule defines a project as portion of highway a state proposes to construct, reconstruct or improve as described in the preliminary design report or applicable environmental document and may consist of several contracts or phases over several years. The cost threshold includes construction cost, right of way costs, and capital outlay support costs.

Figure 4
Mandated NHS Projects by District